EXP-6
A star algorithm

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LAB-6

Aim – To Implement A star Algorithm for Path find & graph traversal

Algorithm -

1. Define list OPEN. OPEN consists of a single Node, Start Node S. If list is empty, return Failure.
2. Remove Node n with smallest value of f(n). from OPEN and move it to list CLOSED. If n Node is goal state, return success.
3. If any successor to n is goal Node, return success and solution by tracing the path from goal node to S. otherwise go to Step 4.
4. For each successor Node, Apply evaluation function f to the Node. If the Node has not been in either list, add it to OPEN.

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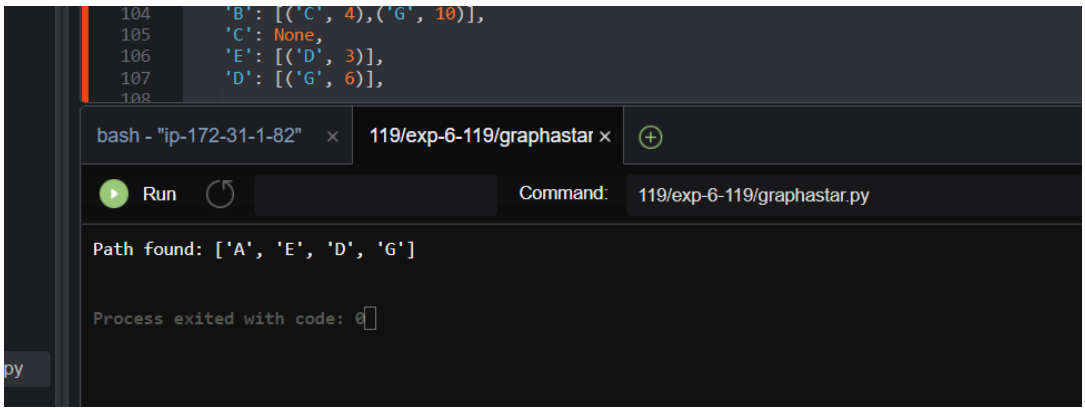
Code-

```
def aStarAlgo(start_node, stop_node):

        open_set = set(start_node)
        closed_set = set()
        g = {} #store distance from starting node
        parents = {}# parents contains an adjacency map of all nodes

        #ditance of starting node from itself is zero
        g[start_node] = 0
        #start_node is root node i.e it has no parent nodes
        #so start_node is set to its own parent node
        parents[start_node] = start_node


        while len(open_set) > 0:
            n = None

            #node with lowest f() is found
            for v in open_set:
                if n == None or g[v] + heuristic(v) < g[n] + heuristic(n):
                    n = v


            if n == stop_node or Graph_nodes[n] == None:
                pass
            else:
                for (m, weight) in get_neighbors(n):
                    #nodes 'm' not in first and last set are added to first
                    #n is set its parent
                    if m not in open_set and m not in closed_set:
                        open_set.add(m)
                        parents[m] = n
                        g[m] = g[n] + weight


                    #for each node m,compare its distance from start i.e g(m) to the
                    #from start through n node
                    else:
```

```
                if g[m] > g[n] + weight:
                    #update g(m)
                    g[m] = g[n] + weight
                    #change parent of m to n
                    parents[m] = n

                    #if m in closed set,remove and add to open
                    if m in closed_set:
                        closed_set.remove(m)
                        open_set.add(m)

            if n == None:
                print('Path does not exist!')
                return None

            # if the current node is the stop_node
            # then we begin reconstructin the path from it to the start_node
            if n == stop_node:
                path = []

                while parents[n] != n:
                    path.append(n)
                    n = parents[n]

                path.append(start_node)

                path.reverse()

                print('Path found: {}'.format(path))
                return path


            # remove n from the open_list, and add it to closed_list
            # because all of his neighbors were inspected
            open_set.remove(n)
            closed_set.add(n)

        print('Path does not exist!')
        return None

#define fuction to return neighbor and its distance
#from the passed node
def get_neighbors(v):
    if v in Graph_nodes:
```

```
        return Graph_nodes[v]
    else:
        return None
#for simplicity we ll consider heuristic distances given
#and this function returns heuristic distance for all nodes
def heuristic(n):
        H_dist = {
            'A': 12,
            'B': 11,
            'C': 14,
            'D': 6,
            'E': 8,
            'G': 0,

        }

        return H_dist[n]

#Describe your graph here
Graph_nodes = {
    'A': [('B', 10), ('E', 8)],
    'B': [('C', 4),('G', 10)],
    'C': None,
    'E': [('D', 3)],
    'D': [('G', 6)],

}
aStarAlgo('A', 'G')
```

OUTPUT-:



Result: Hence we successfully implemented a star algorithm on graph.